FIG. 1A

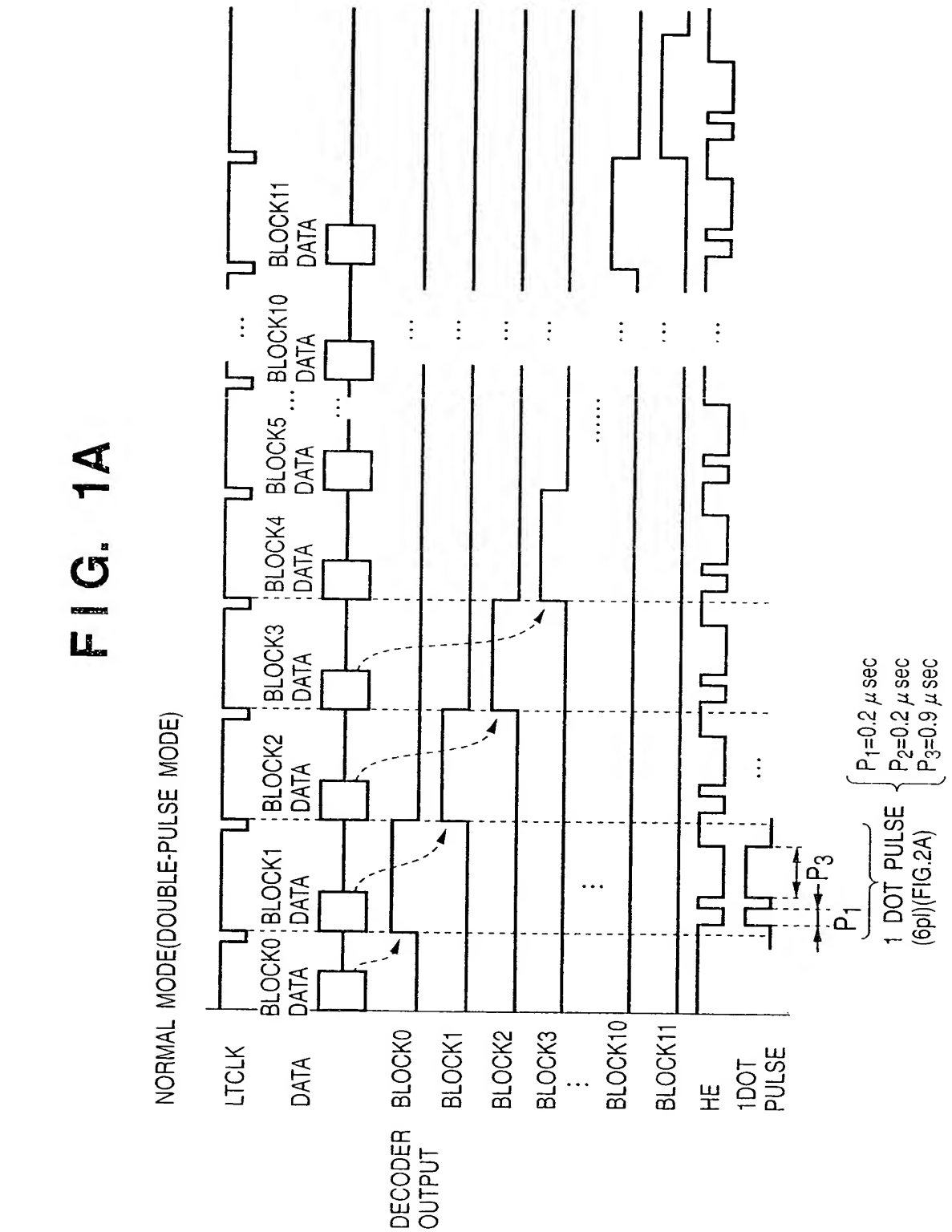

NORMAL MODE(DOUBLE-PULSE MODE)
LTCLK
DATA
BLOCK0 DATA
BLOCK1 DATA
BLOCK2 DATA
BLOCK3 DATA
BLOCK4 DATA
BLOCK5 DATA
BLOCK10 DATA
BLOCK11 DATA
DECODER OUTPUT
BLOCK0
BLOCK1
BLOCK2
BLOCK3
BLOCK10
BLOCK11
HE
1DOT PULSE
P3
P1
1 DOT PULSE (6pl)(FIG.2A)
P1=0.2 μsec
P2=0.2 μsec
P3=0.9 μsec

FIG. 1B

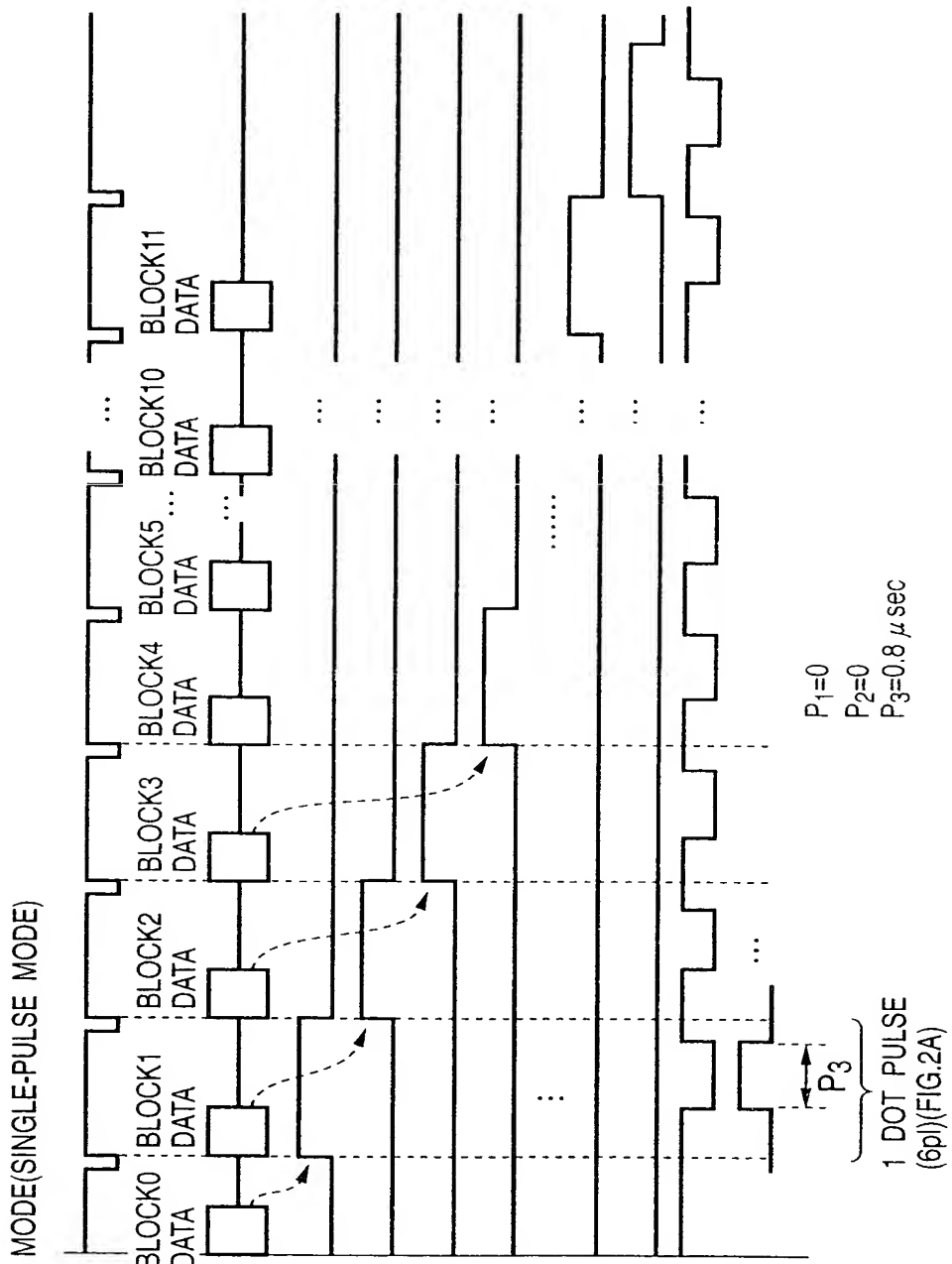

NORMAL MODE(SINGLE-PULSE MODE)
LTCLK
DATA
BLOCK0 DATA
BLOCK1 DATA
BLOCK2 DATA
BLOCK3 DATA
BLOCK4 DATA
BLOCK5 DATA
BLOCK10 DATA
BLOCK11 DATA
DECODER OUTPUT
BLOCK0
BLOCK1
BLOCK2
BLOCK3
BLOCK10
BLOCK11
HE
1DOT PULSE
P3
1 DOT PULSE (6pl)(FIG.2A)
P1=0
P2=0
P3=0.8 μsec

FIG. 1C

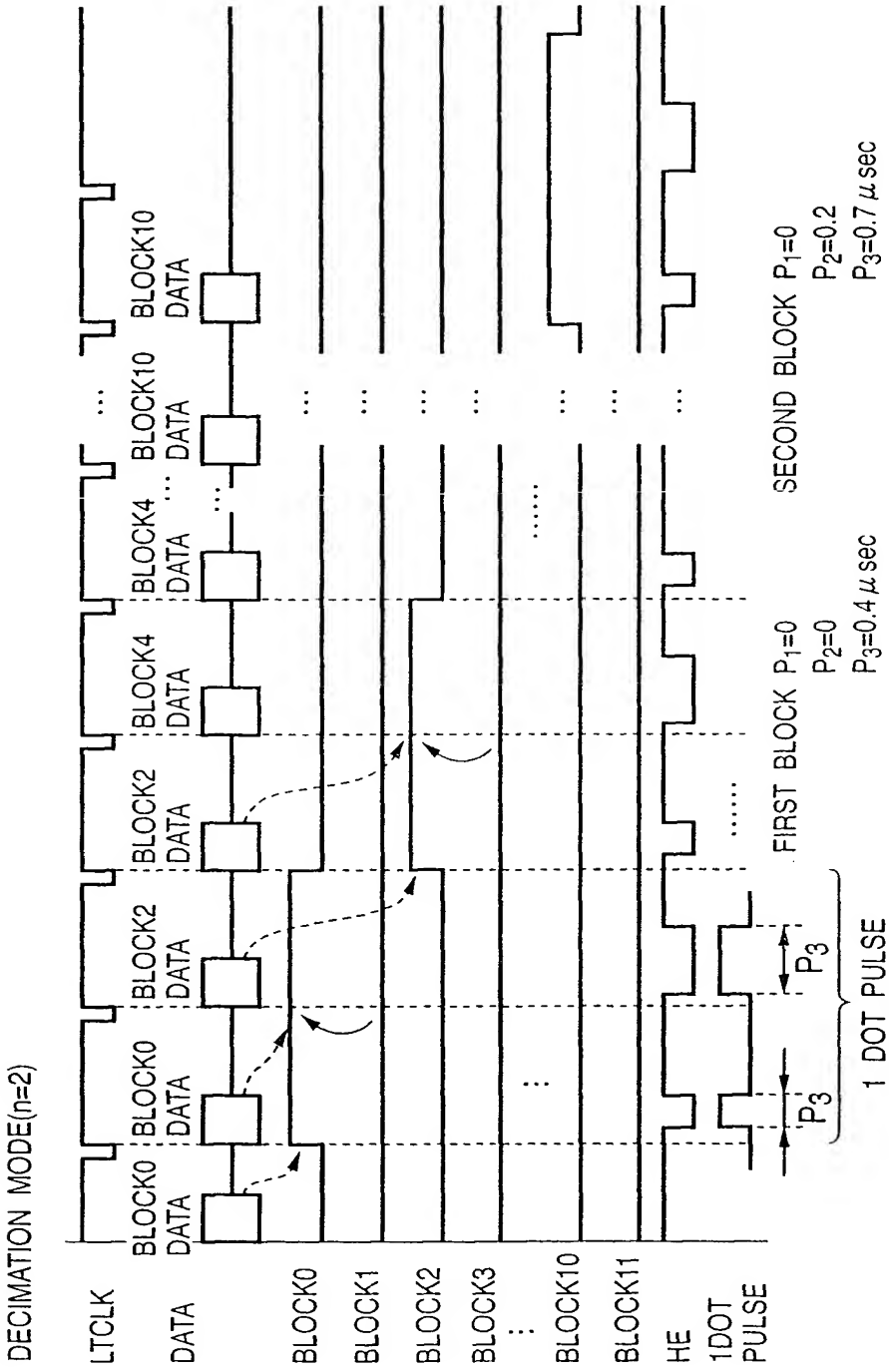

DECIMATION MODE(n=2)
LTCLK
DATA
DECODER OUTPUT
HE
1DOT PULSE
BLOCK0
BLOCK1
BLOCK2
BLOCK3
BLOCK10
BLOCK11
BLOCK0 DATA
BLOCK2 DATA
BLOCK4 DATA
BLOCK10 DATA
FIRST BLOCK P1=0 P2=0 P3=0.4 μsec
SECOND BLOCK P1=0 P2=0.2 P3=0.7 μsec
P3
1 DOT PULSE (9pl)(FIG.2B)

FIG. 1D

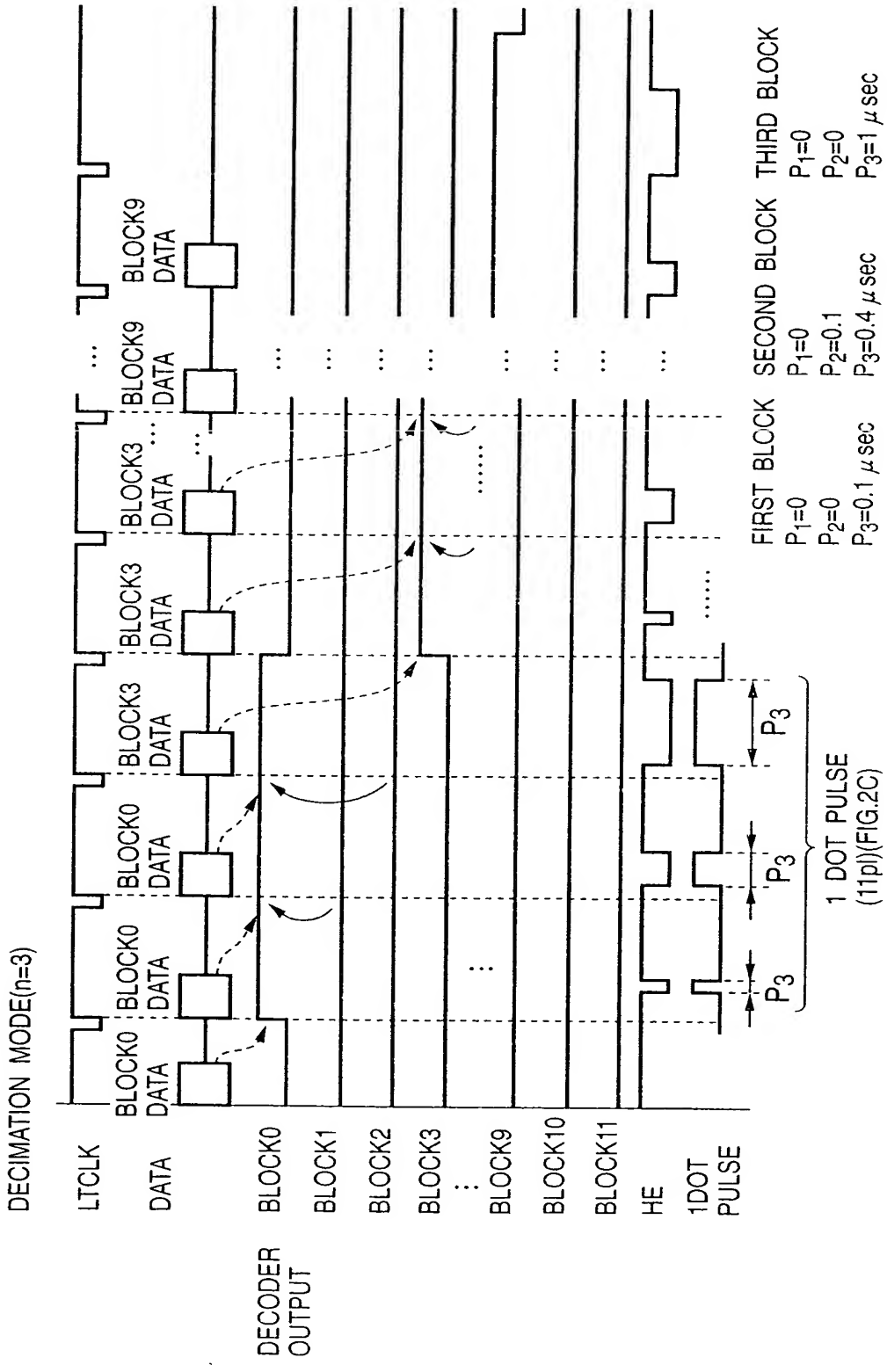

DECIMATION MODE(n=3)
LTCLK
DATA
DECODER OUTPUT
HE
1DOT PULSE
BLOCK0 DATA
BLOCK0
BLOCK1
BLOCK2
BLOCK3
BLOCK9
BLOCK10
BLOCK11
BLOCK3 DATA
BLOCK9 DATA
P3
1 DOT PULSE (11pl)(FIG.2C)
FIRST BLOCK
P1=0
P2=0
P3=0.1 μsec
SECOND BLOCK
P1=0
P2=0.1
P3=0.4 μsec
THIRD BLOCK
P1=0
P2=0
P3=1 μsec

FIG. 2A

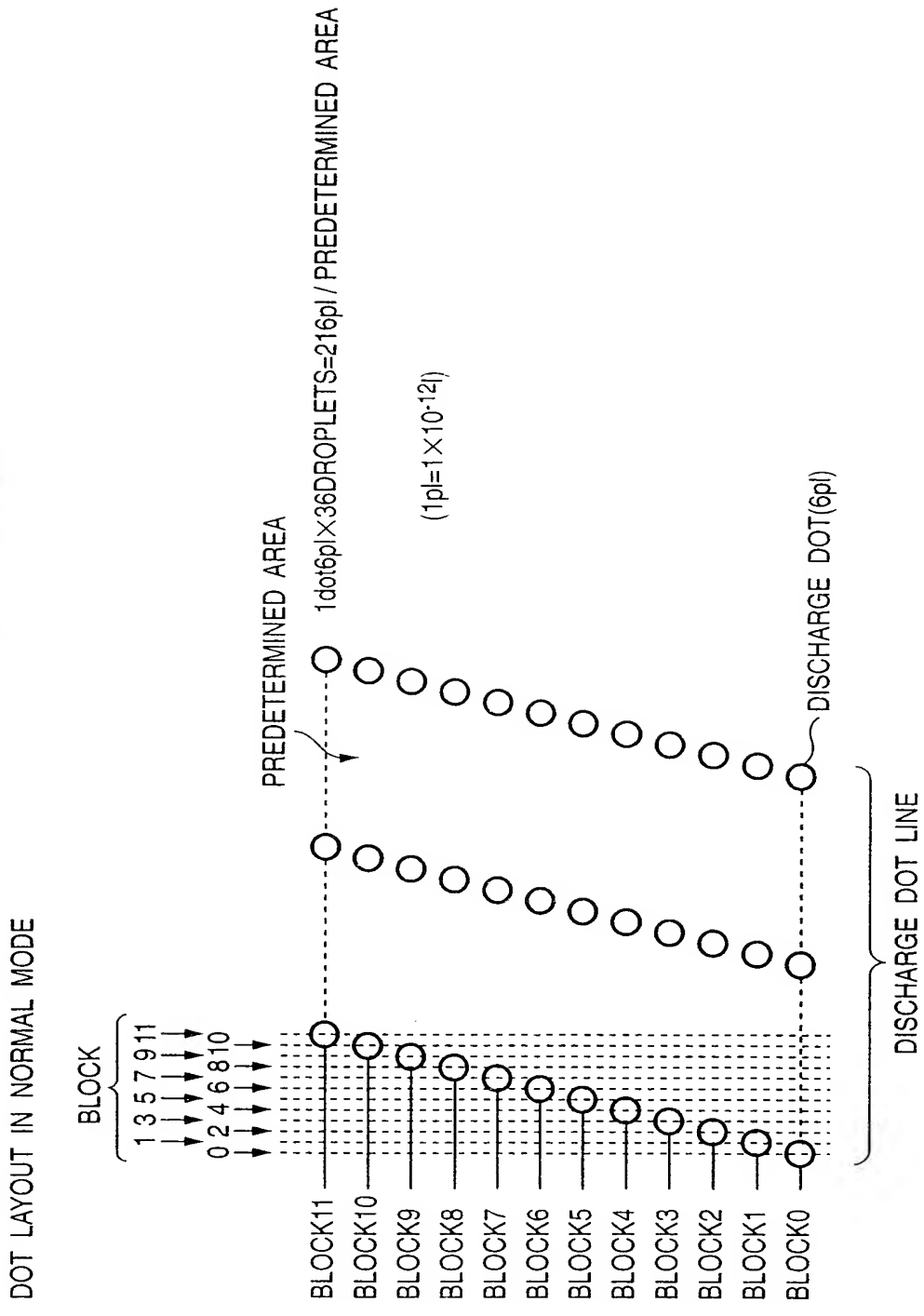

DOT LAYOUT IN NORMAL MODE
BLOCK
1 3 5 7 9 11
0 2 4 6 8 10
PREDETERMINED AREA
1dot6pl×36DROPLETS=216pl / PREDETERMINED AREA
(1pl=1×10-12l)
DISCHARGE DOT(6pl)
DISCHARGE DOT LINE
BLOCK11
BLOCK10
BLOCK9
BLOCK8
BLOCK7
BLOCK6
BLOCK5
BLOCK4
BLOCK3
BLOCK2
BLOCK1
BLOCK0

FIG. 2B

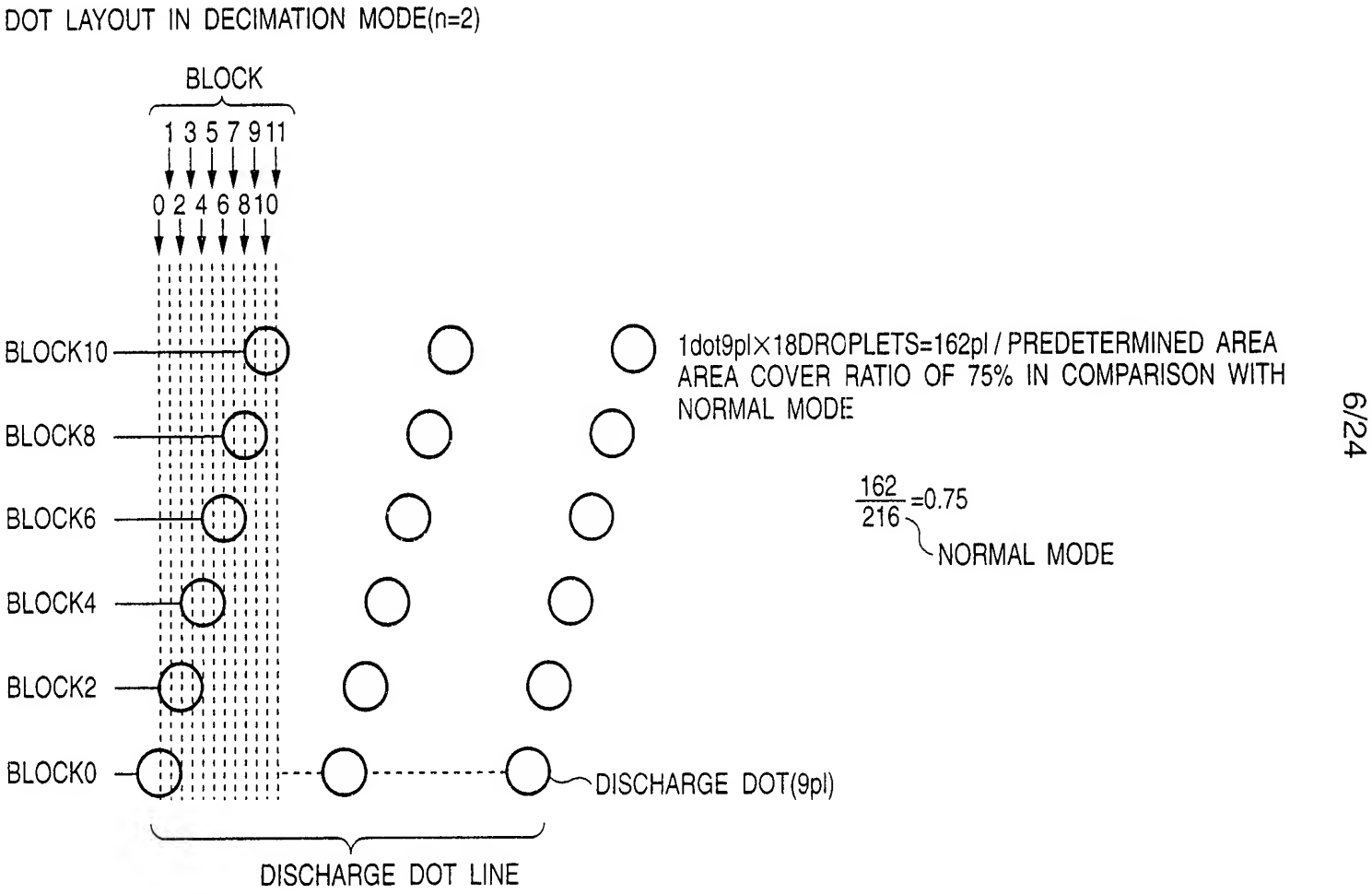
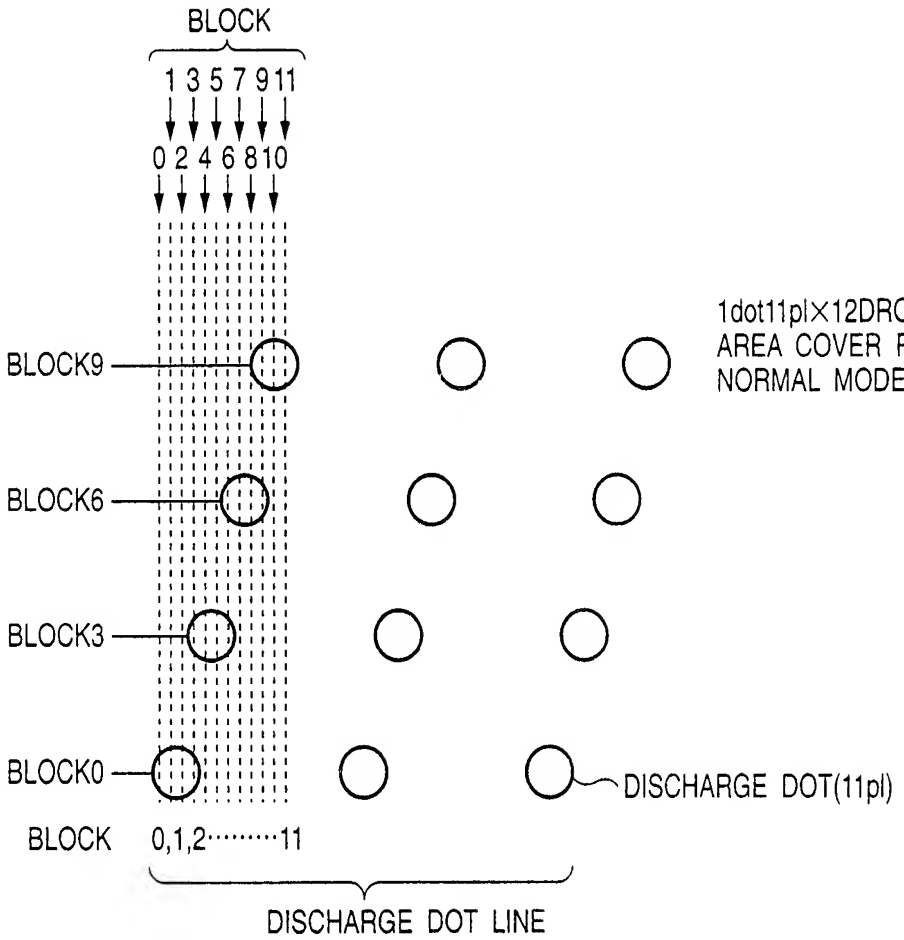

DOT LAYOUT IN DECIMATION MODE(n=2)
BLOCK
1 3 5 7 9 11
0 2 4 6 8 10
BLOCK10
BLOCK8
BLOCK6
BLOCK4
BLOCK2
BLOCK0
1dot9pl×18DROPLETS=162pl / PREDETERMINED AREA
AREA COVER RATIO OF 75% IN COMPARISON WITH
NORMAL MODE
162/216=0.75
NORMAL MODE
DISCHARGE DOT(9pl)
DISCHARGE DOT LINE

FIG. 2C

DOT LAYOUT IN DECIMATION MODE(n=3)



1dot11pl×12DROPLETS=132pl / PREDETERMINED AREA
AREA COVER RATIO OF 61% IN COMPARISON WITH NORMAL MODE

$$\frac{132}{216}=0.61$$

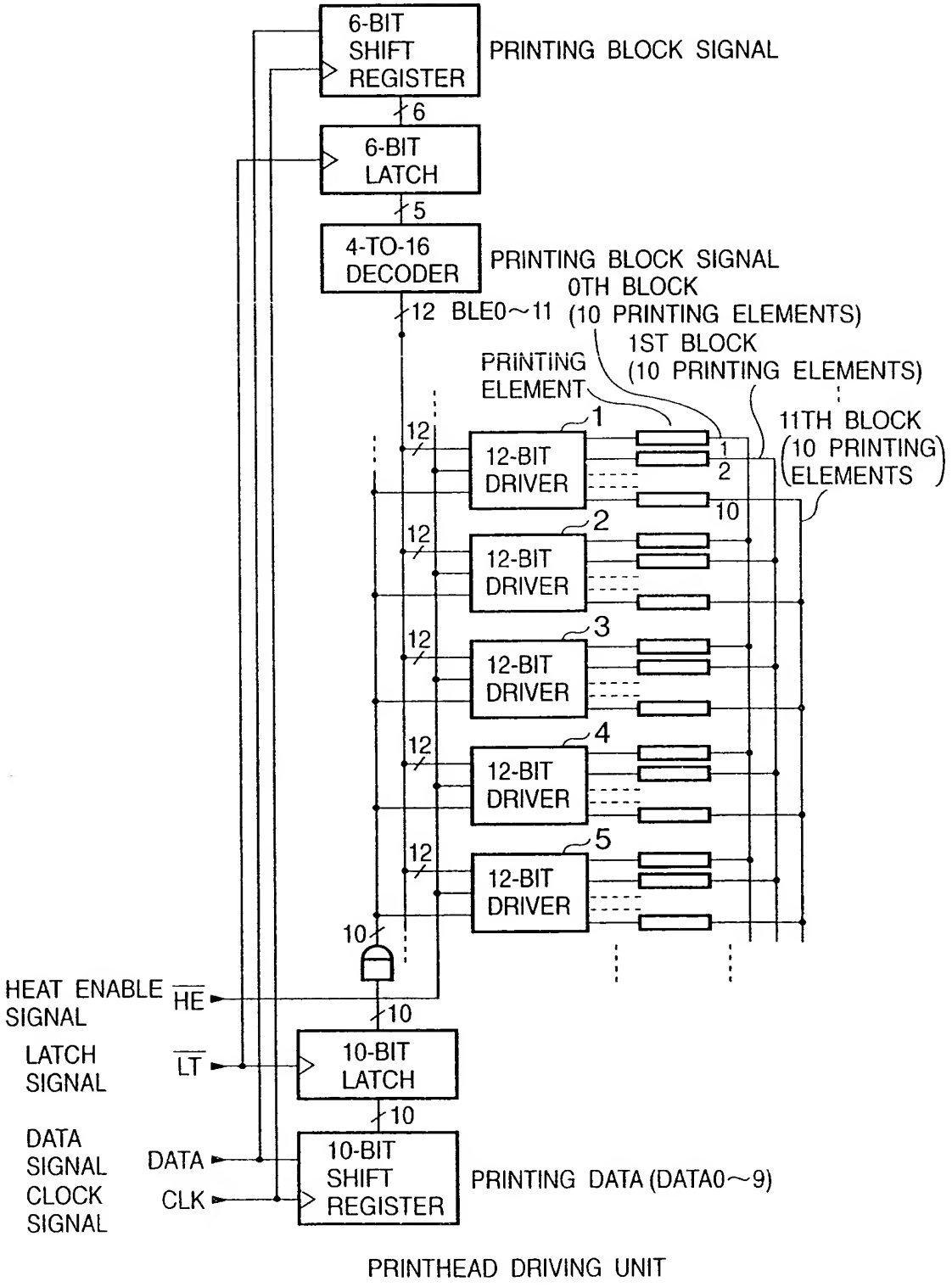
FIG. 3

FIRST EMBODIMENT

PRINTHEAD TEMPERATURE-PRINTING MODE TABLE

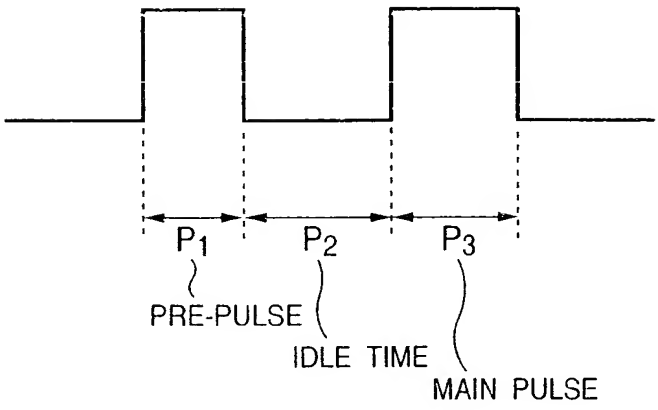
PRINTHEAD TEMPERATURE	30℃ OR LESS	30℃ TO 35℃	36℃ TO 40℃	41℃ OR MORE
PRINTING MODE	NORMAL MODE (DOUBLE-PULSE MODE)	NORMAL MODE (SINGLE-PULSE MODE)	DECIMATION MODE (n=2)	DECIMATION MODE (n=3)

FIG. 4



PRINTHEAD DRIVING UNIT

FIG. 5



DOUBLE-PULSE DRIVING IN
CONVENTIONAL PRINTHEAD

FIG. 6

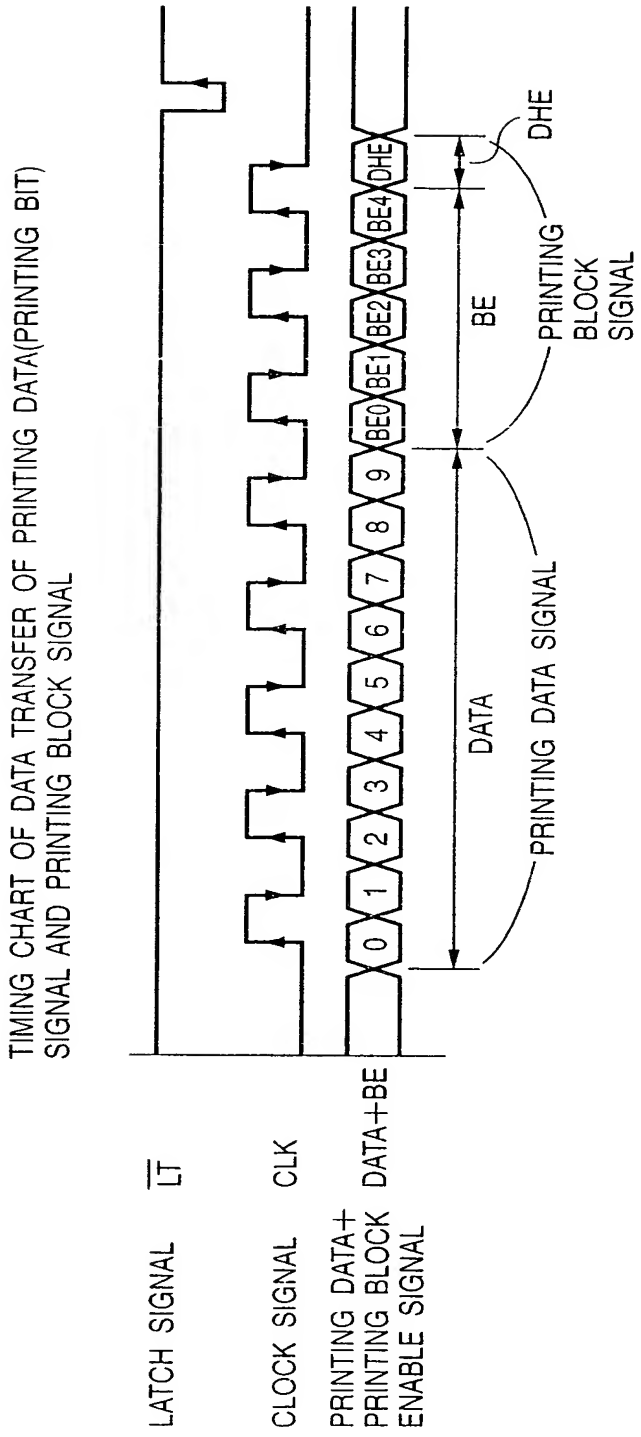

TIMING CHART OF DATA TRANSFER OF PRINTING DATA(PRINTING BIT) SIGNAL AND PRINTING BLOCK SIGNAL
LATCH SIGNAL
LT
CLOCK SIGNAL
CLK
PRINTING DATA+ PRINTING BLOCK ENABLE SIGNAL
DATA+BE
0
1
2
3
4
5
6
7
8
9
BE0
BE1
BE2
BE3
BE4
DHE
DATA
BE
PRINTING DATA SIGNAL
PRINTING BLOCK SIGNAL
DHE

FIG. 7

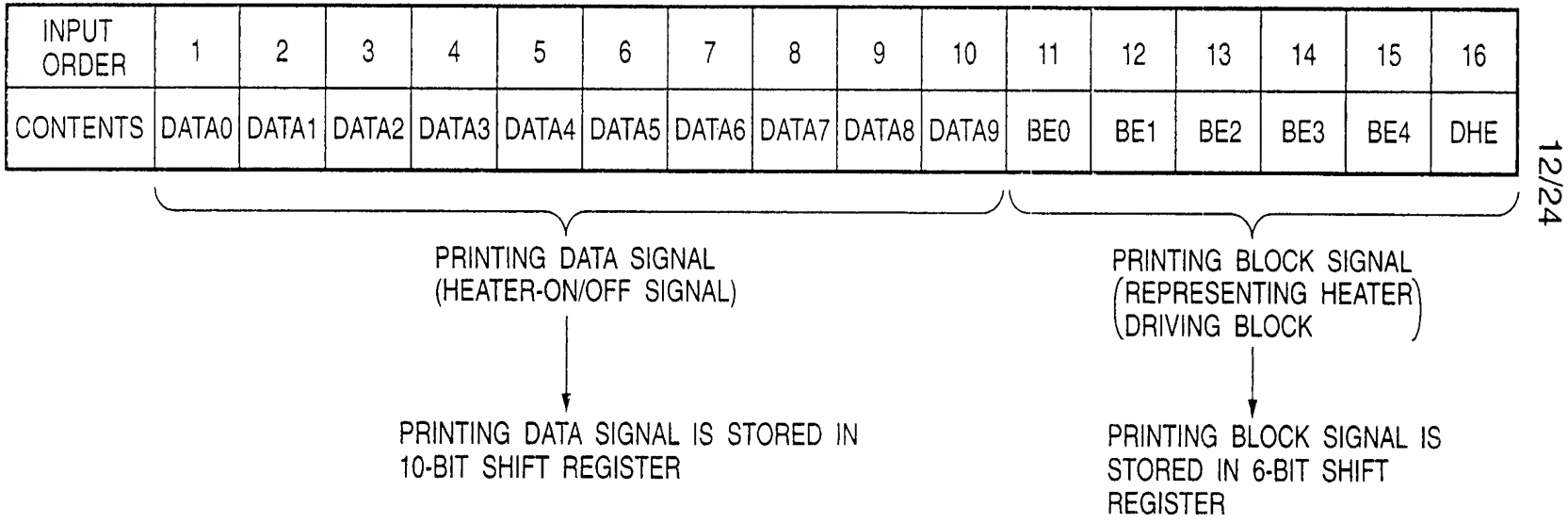

INPUT ORDER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
CONTENTS
DATA0
DATA1
DATA2
DATA3
DATA4
DATA5
DATA6
DATA7
DATA8
DATA9
BE0
BE1
BE2
BE3
BE4
DHE
PRINTING DATA SIGNAL (HEATER-ON/OFF SIGNAL)
PRINTING BLOCK SIGNAL (REPRESENTING HEATER DRIVING BLOCK
PRINTING DATA SIGNAL IS STORED IN 10-BIT SHIFT REGISTER
PRINTING BLOCK SIGNAL IS STORED IN 6-BIT SHIFT REGISTER

FIG. 8

TIMING CHART OF DATA TRANSFER OF PRINTING DATA(PRINTING BIT)
SIGNAL AND PRINTING BLOCK SIGNAL, AND DRIVING OF HEATER ELEMENT

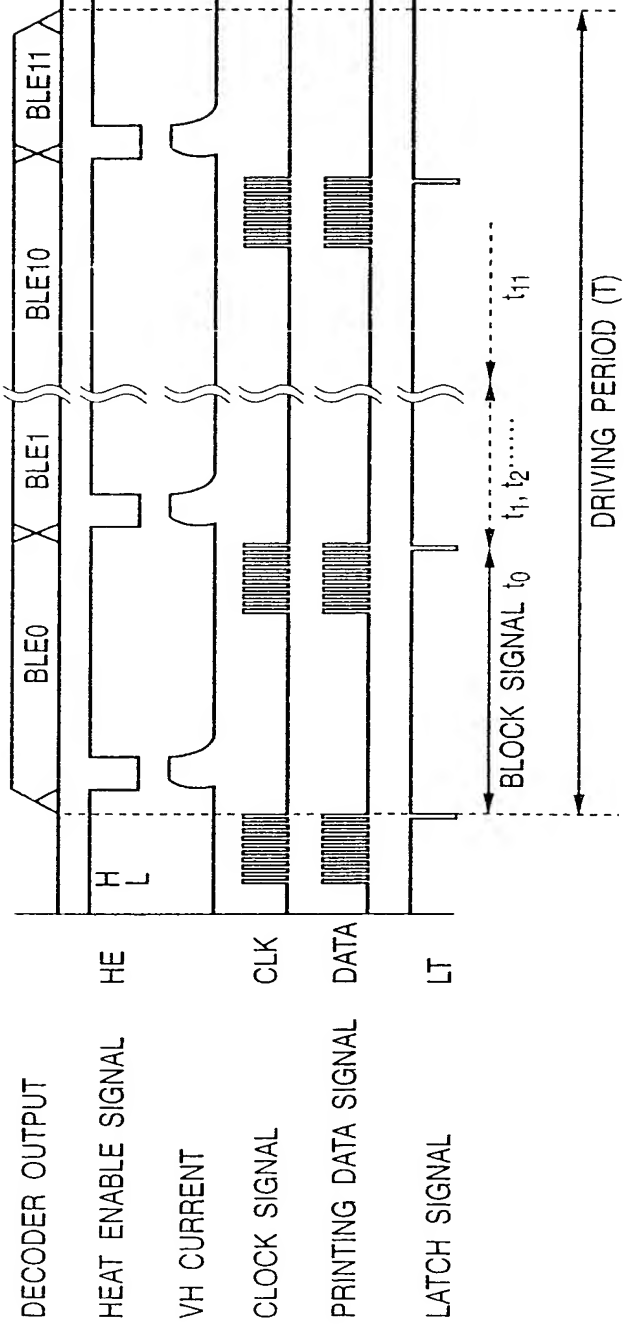


FIG. 9

BLOCK DATA

	DECODER INPUT				DECODER OUTPUT										
CODE	BE3	BE2	BE1	BE0	BLE15	BLE14	BLE13	BLE12	BLE11	.....	BLE4	BLE3	BLE2	BLE1	BLE0
0	L	L	L	L	L	L	L	L	L	.....	L	L	L	L	H
1	L	L	L	H	L	L	L	L	L	.....	L	L	L	H	L
2	L	L	H	L	L	L	L	L	L	.....	L	L	H	L	L
3	L	L	H	H	L	L	L	L	L	.....	L	H	L	L	L
4	L	H	L	L	L	L	L	L	L	.....	H	L	L	L	L
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮	⋮	⋮	⋮
11	H	L	H	H	L	L	L	L	H	.....	L	L	L	L	L
12	H	H	L	L	L	L	L	H	L	.....	L	L	L	L	L
13	H	H	L	H	L	L	H	L	L	.....	L	L	L	L	L
14	H	H	H	L	L	H	L	L	L	.....	L	L	L	L	L
15	H	H	H	H	H	L	L	L	L	.....	L	L	L	L	L

L : LOW(ACTIVE)
H: HIGH

12 DECODER OUTPUTS(USE)

FIG. 10

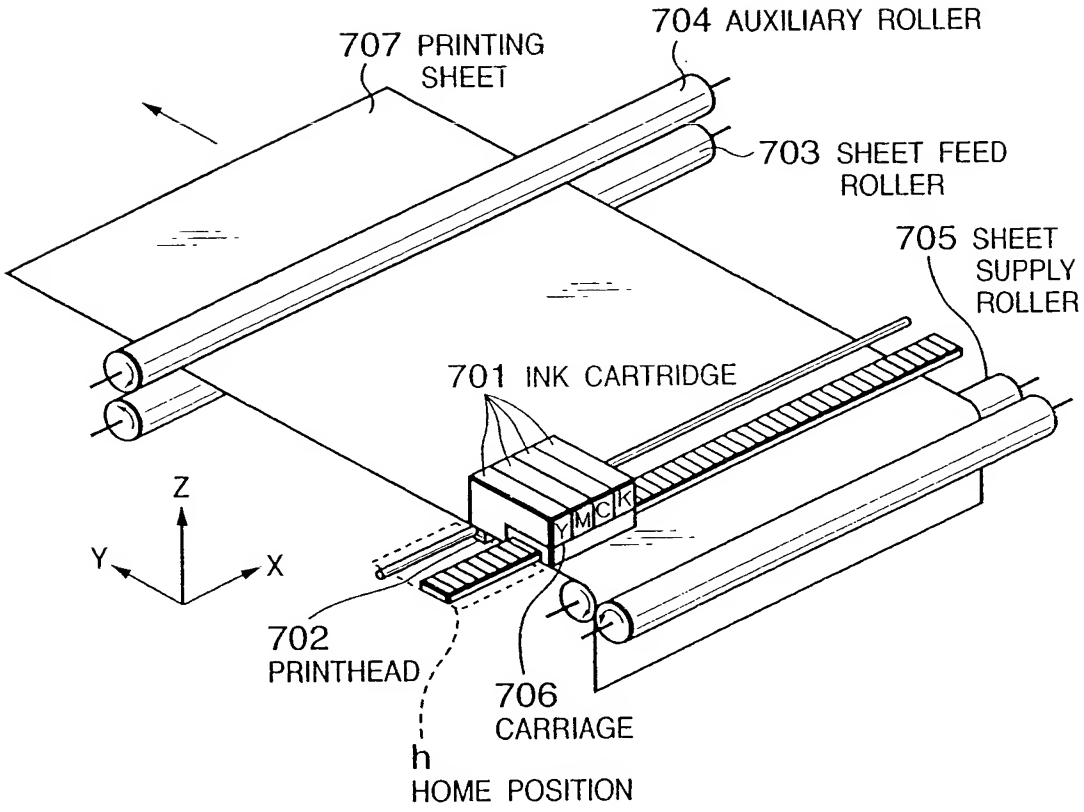

704 AUXILIARY ROLLER
707 PRINTING SHEET
703 SHEET FEED ROLLER
705 SHEET SUPPLY ROLLER
701 INK CARTRIDGE
Y
M
C
K
Z
Y
X
702 PRINTHEAD
706 CARRIAGE
h
HOME POSITION

FIG. 11

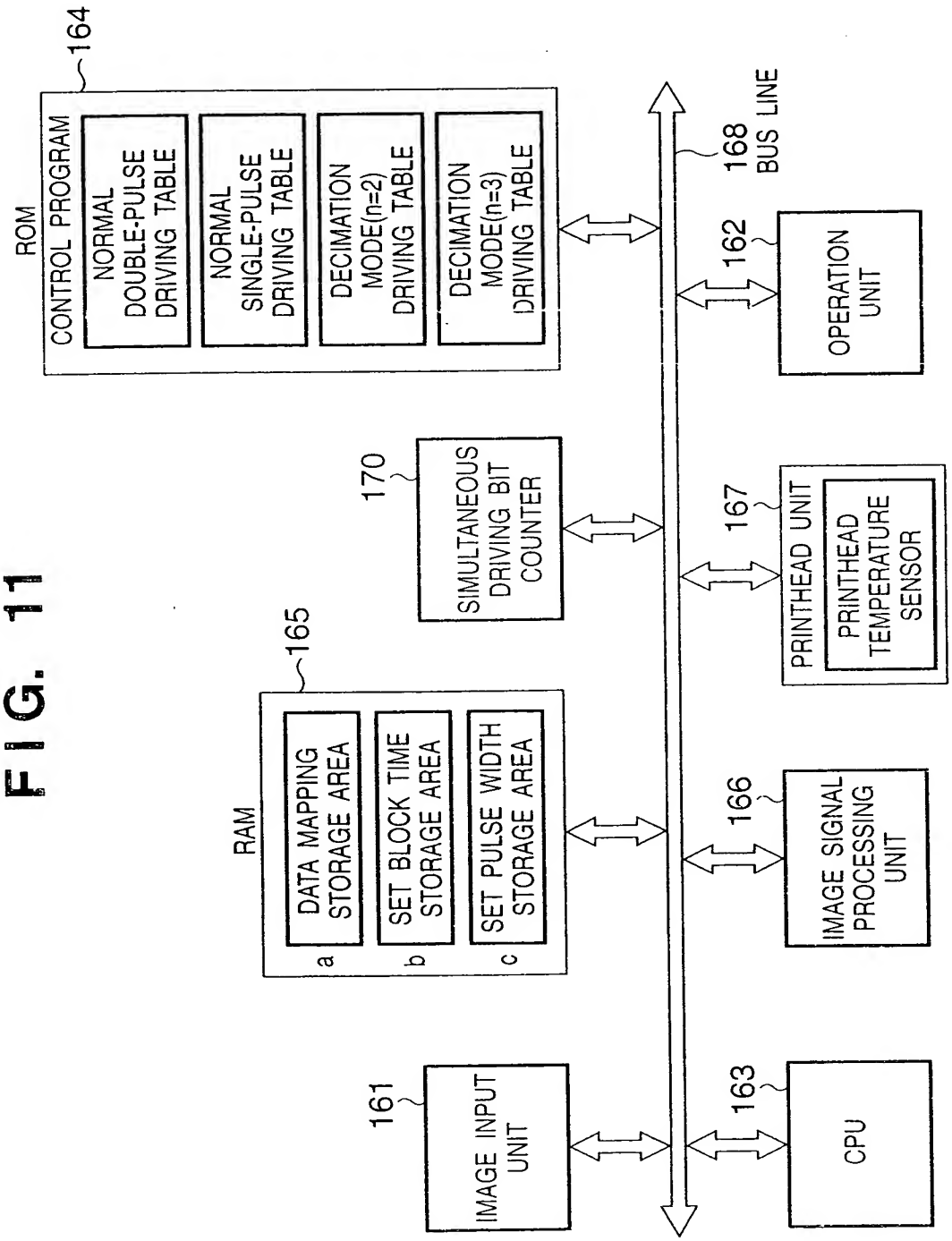

ROM
164
CONTROL PROGRAM
NORMAL DOUBLE-PULSE DRIVING TABLE
NORMAL SINGLE-PULSE DRIVING TABLE
DECIMATION MODE(n=2) DRIVING TABLE
DECIMATION MODE(n=3) DRIVING TABLE
168
BUS LINE
162
OPERATION UNIT
170
SIMULTANEOUS DRIVING BIT COUNTER
167
PRINTHEAD UNIT
PRINTHEAD TEMPERATURE SENSOR
165
RAM
DATA MAPPING STORAGE AREA
a
SET BLOCK TIME STORAGE AREA
b
SET PULSE WIDTH STORAGE AREA
c
166
IMAGE SIGNAL PROCESSING UNIT
161
IMAGE INPUT UNIT
163
CPU

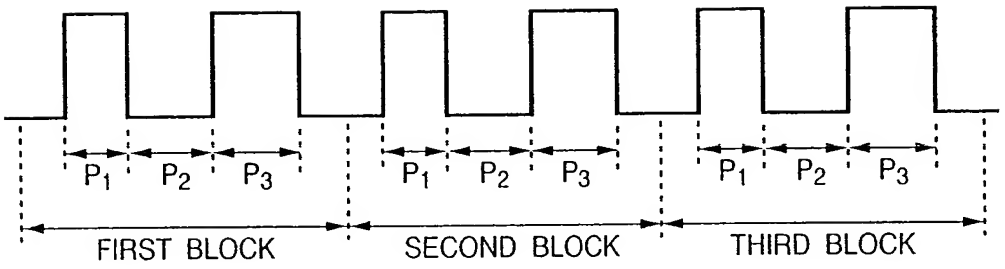
FIG. 12A

DRIVING PULSE WIDTH TABLE

	PULSE WIDTH	NORMAL DOUBLE-PULSE DRIVING	NORMAL SINGLE-PULSE DRIVING	DECIMATION MODE (n=2)	DECIMATION MODE (n=3)
FIRST BLOCK	P1[μsec]	0.20	0.00	0.00	0.00
	P2[μsec]	0.20	0.00	0.00	0.00
	P3[μsec]	0.70	0.80	0.40	0.10
SECOND BLOCK	P1[μsec]	—	—	0.00	0.00
	P2[μsec]	—	—	0.20	0.10
	P3[μsec]	—	—	0.70	0.40
THIRD BLOCK	P1[μsec]	—	—	—	0.00
	P2[μsec]	—	—	—	0.00
	P3[μsec]	—	—	—	1.00
NUMBER OF BLOCKS		UNCHANGED	UNCHANGED	DECIMATED TO 1/2	DECIMATED TO 1/3

P1: PRE-PULSE
P2: IDLE TIME
P3: MAIN PULSE

FIG. 12B



P1: PRE-PULSE
P2: IDLE TIME
P3: MAIN PULSE

FIG. 13

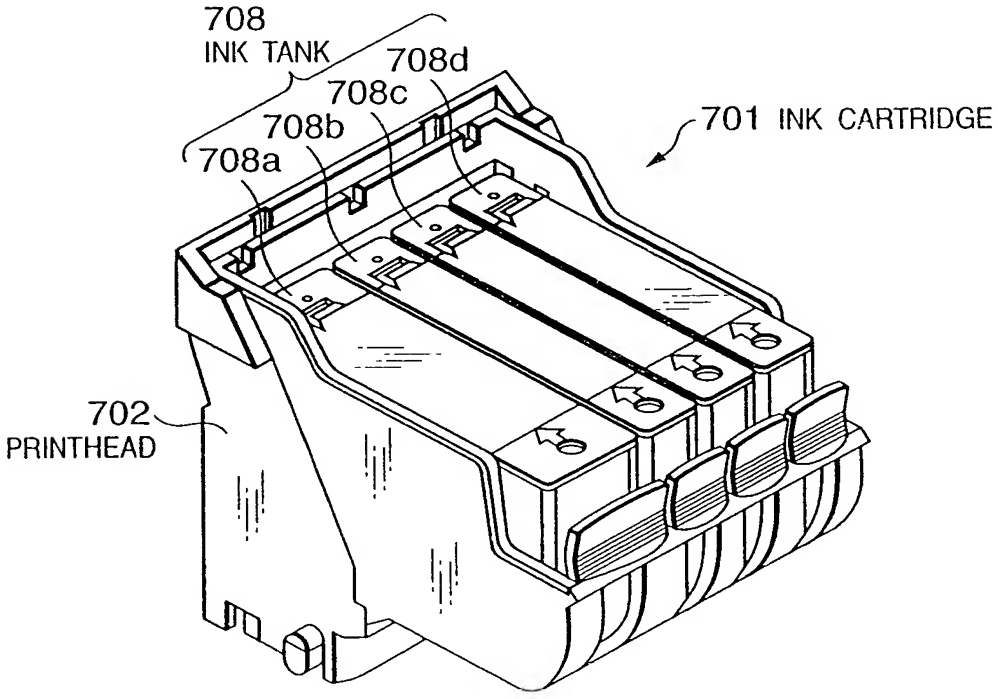


FIG. 14

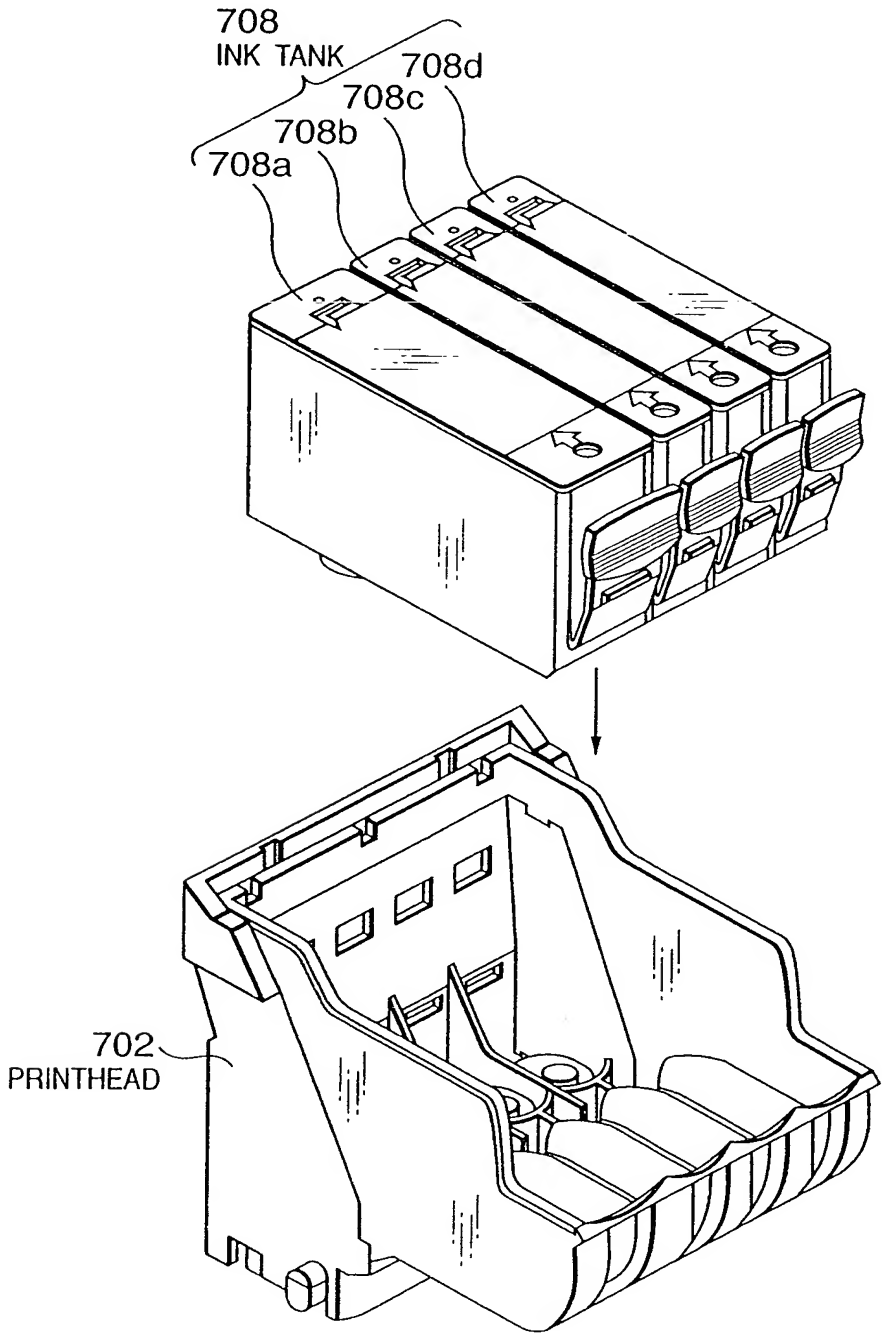


FIG. 15

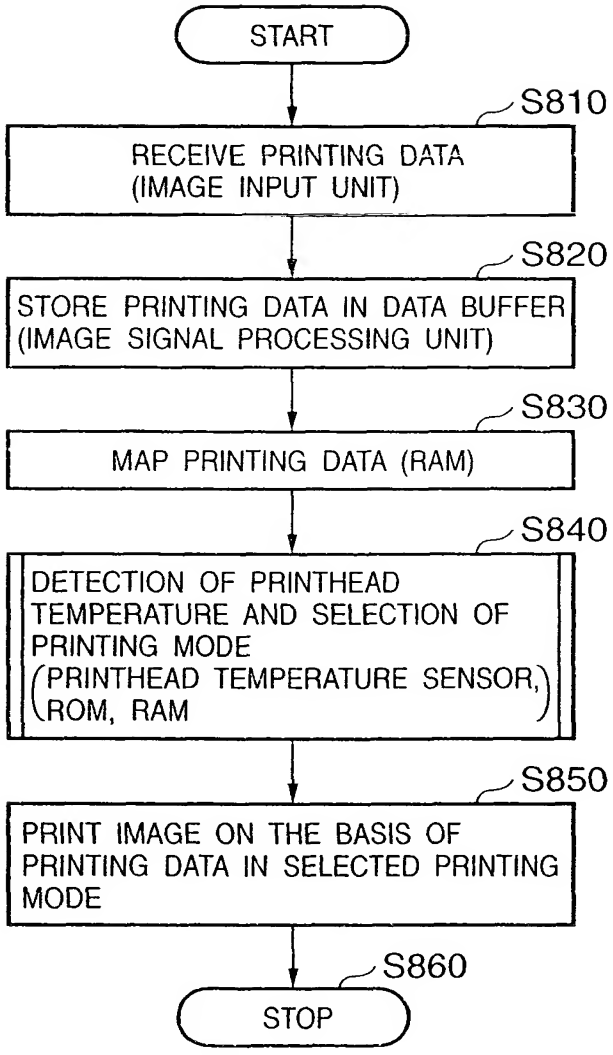

START
S810
RECEIVE PRINTING DATA (IMAGE INPUT UNIT)
S820
STORE PRINTING DATA IN DATA BUFFER (IMAGE SIGNAL PROCESSING UNIT)
S830
MAP PRINTING DATA (RAM)
S840
DETECTION OF PRINTHEAD TEMPERATURE AND SELECTION OF PRINTING MODE (PRINTHEAD TEMPERATURE SENSOR, ROM, RAM
S850
PRINT IMAGE ON THE BASIS OF PRINTING DATA IN SELECTED PRINTING MODE
S860
STOP

FIG. 16

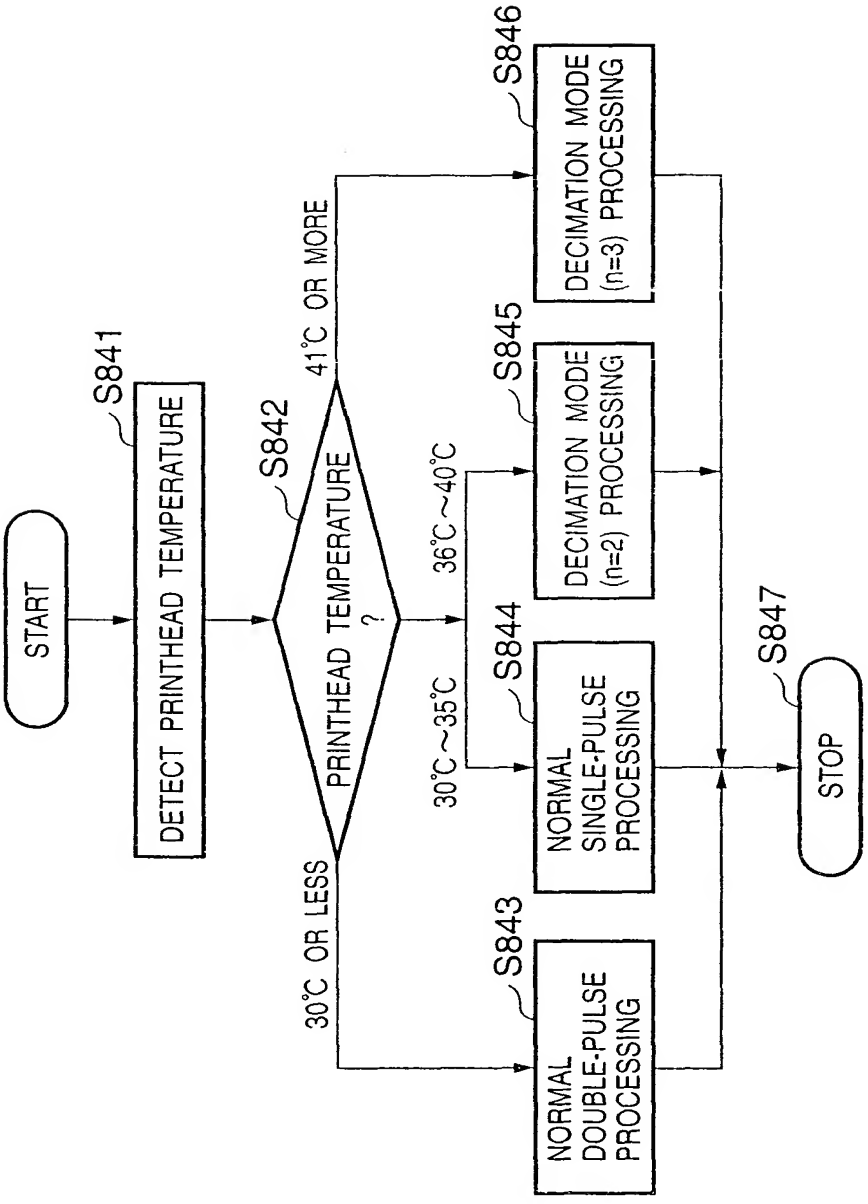

START
S841
DETECT PRINTHEAD TEMPERATURE
S842
PRINTHEAD TEMPERATURE ?
30℃ OR LESS
36℃～40℃
41℃ OR MORE
30℃～35℃
S843
NORMAL DOUBLE-PULSE PROCESSING
S844
NORMAL SINGLE-PULSE PROCESSING
S845
DECIMATION MODE (n=2) PROCESSING
S846
DECIMATION MODE (n=3) PROCESSING
S847
STOP

FIG. 17

SECOND EMBODIMENT

SIMULTANEOUS DRIVING BIT-PRINTING MODE TABLE

NUMBER OF BITS TO BE SIMULTANEOUSLY DRIVEN	0~2	3~5	6~8	9~10
PRINTING MODE	NORMAL DOUBLE-PULSE MODE	NORMAL SINGLE-PULSE MODE	DECIMATION (n=2) MODE	DECIMATION (n=3) MODE

FIG. 18

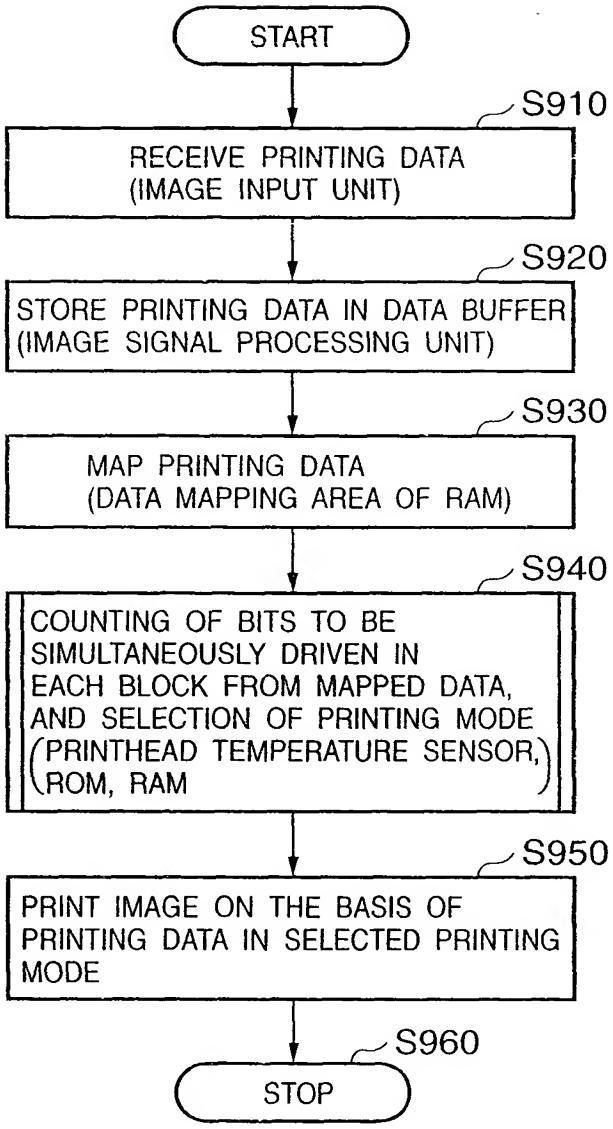
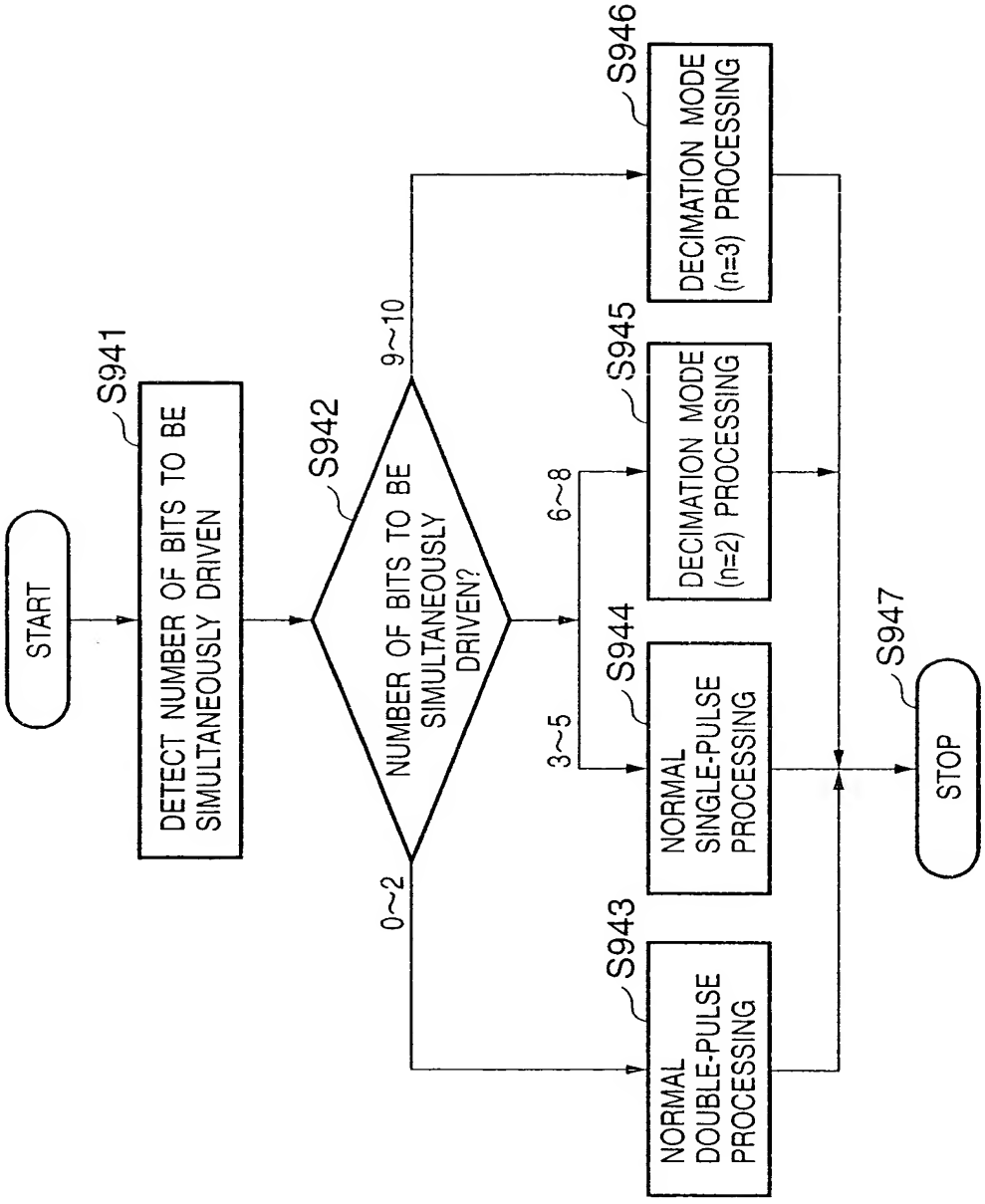

START
S910
RECEIVE PRINTING DATA (IMAGE INPUT UNIT)
S920
STORE PRINTING DATA IN DATA BUFFER (IMAGE SIGNAL PROCESSING UNIT)
S930
MAP PRINTING DATA (DATA MAPPING AREA OF RAM)
S940
COUNTING OF BITS TO BE SIMULTANEOUSLY DRIVEN IN EACH BLOCK FROM MAPPED DATA, AND SELECTION OF PRINTING MODE (PRINTHEAD TEMPERATURE SENSOR, ROM, RAM
S950
PRINT IMAGE ON THE BASIS OF PRINTING DATA IN SELECTED PRINTING MODE
S960
STOP

FIG. 19


START
S941
DETECT NUMBER OF BITS TO BE SIMULTANEOUSLY DRIVEN
S942
NUMBER OF BITS TO BE SIMULTANEOUSLY DRIVEN?
0~2
3~5
6~8
9~10
S943
NORMAL DOUBLE-PULSE PROCESSING
S944
NORMAL SINGLE-PULSE PROCESSING
S945
DECIMATION MODE (n=2) PROCESSING
S946
DECIMATION MODE (n=3) PROCESSING
S947
STOP